Appendix 3B

Quality Assurance Project Plan for Waste Analysis Plan

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APPENDIX 3B
QUALITY ASSURANCE PROJECT PLAN FOR WASTE ANALYSIS PLAN

Contents

Tables

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Acronyms

ASTM	American Society for Testing and Materials
BNI	Bechtel National, Inc.
DOE	United States Department of Energy
DST	double-shell tank
EPA	United States Environmental Protection Agency
EQL	estimated quantitation limit
HLW	high-level waste
LAW	low-activity waste
LDR	Land Disposal Restrictions
LIMS	laboratory information management system
MDL	method detection limit
PCB	Polychlorinated Biphenyl
QA	quality assurance
QAPjP	Quality Assurance Project Plan
QC	quality control
WTP	River Protection Project – Waste Treatment Plant
WAC	Washington Administrative Code
WAP	Waste Analysis Plan

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPjP) was prepared to support sampling and analysis to be implemented by the River Protection Project – Waste Treatment Plant (WTP), particularly in support of the verification and characterization of the waste feed and the characterization of secondary waste streams.

This QAPjP will ensure that the quality and quantity of data resulting from these sampling and analysis activities can support the decision-making process for the management of WTP wastes. This document was prepared using guidance provided in the following references:

- *EPA Guidance for Quality Assurance Project Plans* (EPA 1998)
- *Test Methods for Evaluating Solid Waste-Physical/Chemical Methods* (EPA 1997)
- *Quality Assurance Manual* (QA Manual)

Quality assurance (QA) and quality control (QC) ensure that an activity or project meets a required quality standard. QA is associated with record-keeping, tracking, audits, and assessments, and involves determining the desired level of quality and setting limits in advance. QC is associated with the controls that are implemented while an activity is being performed. This QAPjP will comply with the applicable requirements of the QA Manual and will become effective at the commencement of laboratory operations.

Controlled copies of this QAPjP will be kept at the WTP facility. The Project Document Control Manager, or equivalent title, will be responsible for ensuring that controlled copies of the QAPjP are kept current when revisions to this QAPjP are made.

2.0 PROJECT DESCRIPTION

The United States Department of Energy (DOE) has contracted Bechtel National, Inc. (BNI) to design, construct, and commission the WTP. The WTP will store and treat mixed waste currently stored in the Hanford tank system unit. The waste feed will be divided into two streams for processing and disposal purposes: high-level waste (HLW) stream, which is composed of the higher radionuclide and solids content of the waste feed, and low-activity waste (LAW) stream, which has a lower radionuclide and solids content. The LAW stream is generally the supernatant portion of the tank waste. The treatment processes are being designed to pretreat the waste feed to separate the waste feed into the HLW and LAW streams, immobilize the waste streams in a glass matrix through vitrification, and treat the off-gas to a level that protects human health and the environment.

BNI will conduct sampling and analysis to characterize incoming waste feed and to assess the effectiveness of the treatment processes at the WTP. Secondary waste will also be sampled and analyzed if process knowledge is insufficient to properly designate the secondary waste. Figure 3B-1 presents a simplified flow diagram showing the locations where samples will be collected for analytical testing to support regulatory decisions.

3.0 CONSTITUENTS OF CONCERN

The *River Protection Project – Waste Treatment Plant Waste Analysis Plan* (WAP)(Appendix 3A) identifies the sampling locations and associated constituents of concern for verification of the waste feed and for characterization of the waste feed.

3.1 WASTE ACCEPTANCE CRITERIA

Verification analysis determines whether the waste feed can be accepted into the WTP for processing. The verification waste acceptance criteria are:

- Total organic carbon
- Polychlorinated biphenyls (PCBs)
- pH
- Compatibility

The waste acceptance criteria for waste feed verification will be re-evaluated as a result of the *Regulatory Data Quality Objectives Supporting Tank Waste Remediation System Privatizatioin Project* (Regulatory DQO) process (Wiemers and others, 1998) and the environmental risk assessment, currently under development. The Regulatory DQO process (Wiemers and others, 1998) and the environmental risk assessment are scheduled for completion prior to the commencement of cold operation of the WTP. The DQO process is an ongoing activity and may periodically affect the list of analytes.

3.2 CHARACTERIZATION OF THE WASTE FEED

The Regulatory DQO (Wiemers and others, 1998) process will determine the constituents of concern and analytical methods appropriate for the characterization of the waste feed. The Regulatory DQO (Wiemers and others, 1998) process is progressing according to the *Regulatory DQO Test Plan for Determining Method Detection Limits, Estimated Quantitation Limits, and Quality Assurance Criteria for Specified Analytes* (Patello and others, 2001) and is projected to be completed prior to commissioning of the WTP. The DQO process is an ongoing activity and may periodically change the constituents of concern and the selection of analytical methods.

4.0 PROJECT MANAGEMENT

This section of the QAPjP addresses the following requirements:

- Project organization and responsibility
- Special training requirements
- Documentation and records
- Standard operating procedures

4.1 PROJECT ORGANIZATION AND RESPONSIBILITY

An example of the WTP management structure supporting sampling and analysis activities is depicted in Figure 3B-2. These organizational structures and functions may change over the life of the facility.

The WTP QA Manager (or designee) reports directly to the WTP Project Manager. The WTP QA Manager will provide independent QA oversight to ensure that onsite and subcontracted sampling and analytical laboratory activities are performed in accordance with this QAPjP.

The facility managers (or designees) for pretreatment, balance of facility, HLW vitrification, and LAW vitrification, supported by the Analytical Laboratory Manager, will coordinate the execution of sampling and analysis activities and ensure compliance with this QAPjP.

The shift managers (or designees) for pretreatment, balance of facility, HLW vitrification, and LAW vitrification will be responsible for the activities associated with sampling.

The WTP Analytical Laboratory Manager (or designee) will ensure that analysis is conducted in accordance with this QAPjP. This manager will oversee the WTP onsite laboratory, will be responsible for the coordination and technical oversight of any subcontracted laboratories, and will conduct periodic assessments to verify that onsite laboratory activities are being performed in accordance with this QAPjP.

Subcontracted analytical laboratory managers will be responsible for ensuring that this QAPjP is implemented in their respective laboratories.

4.2 SPECIAL TRAINING REQUIREMENTS

Individuals involved in sampling, analysis, or data review will be trained and qualified to safely implement the activities addressed in the WAP and this QAPjP. Training will conform to the training requirements specified in the *Washington Administrative Code*, *Personnel Training* (WAC 173-303-330), the QA Manual, and the *River Protection Project – Waste Treatment Plant Dangerous Waste Training Plan* (Chapter 8.0).

Only individuals familiar with and trained in the requirements for waste acceptance criteria will approve waste shipments into the WTP. Evaluations will be performed by process engineers or chemists who are qualified to evaluate the waste for compatibility and acceptability for processing.

Training records will be maintained in accordance with Section 4.3 of this document.

4.3 DOCUMENTATION AND RECORDS

This section presents the requirements associated with the development, management, and distribution of data and documents.

4.3.1 Document and Record Procedures

Documents and records developed as part of the waste analysis program will be generated, reviewed, approved, distributed, used, controlled, and revised in accordance with approved procedures. These procedures will comply with applicable requirements of the QA Manual.

Organizations that generate or use data in an electronic format are responsible for complying with applicable software quality requirements specified in the QA Manual to ensure that data input (and changes to data input) is complete and accurate, and that security and integrity of the data is maintained.

4.3.2 Document and Records Storage

Documents and records will be stored and maintained according to approved procedures consistent with applicable requirements of the QA Manual. These documents and records will include, but will not be limited to, the following:

- Training (see Section 4.2)
- Data report packages
  - Chain-of-custody forms
  - Sampling methods
  - Sampling conditions
  - Sample descriptions
  - Sample management records
  - Analytical methods
  - Data summary reports
  - QA and QC reports
- Assessment reports (including non-conformance and deficiency reports)
- Instrument inspection, maintenance, and calibration logs
- Records and results of waste analysis, specifically:
  - Waste profiles
  - Waste verification
  - Waste confirmation
  - LDR evaluation
  - Waste acceptance
  - Waste non-conformance
  - Corrective actions
  - DST waste feed characterization

4.4 Standard Operating Procedures

Standard operating procedures for waste sampling and analysis will be developed after the system design has been completed and before waste is received for processing. Standard operating procedures will be developed, implemented, and controlled in accordance with applicable requirements of the QA Manual.

5.0 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

5.1 DATA QUALITY OBJECTIVES

The data quality objectives for the WTP and for the characterization of the Hanford tank waste are addressed in the following subsections.

5.1.1 Data Quality Objectives for the WTP

A DQO process [such as the seven-step procedure provided in *Guidance for the Data Quality Objectives Process* (EPA 1994)] may be implemented to support the decision-making process, particularly when complex decisions need to be made using analytical data. Using the DQO process ensures that the data collected are of adequate quality and quantity to support the decision-making process. The seven steps of this process are identified in Table 3B-1, along with a summary of the key activities that are performed under each step.

5.1.2 Regulatory DQO for Hanford Tank Waste Characterization

Characterization of the Hanford waste feed will be performed in conformance with the *Regulatory Data Quality Objectives Supporting Tank Waste Remediation System Privatizatioin Project* (Regulatory DQO) process (Wiemers and others, 1998). This process establishes sample preparation and analytical methods suitable for determining the concentration of selected constituents of concern at method detection limits sufficient for regulatory requirements. After the analytical methods are developed and approved by Ecology, the DST waste feed will be analyzed and the results used to characterize the waste feed prior to transfer to the WTP. The Regulatory DQO process is progressing according to the *Regulatory DQO Test Plan for Determining Method Detection Limits, Estimated Quantitation Limits, and Quality Assurance Criteria for Specified Analytes* (Patello and others, 2001) and is projected to be completed prior to commissioning of the WTP. The DQO process is an ongoing activity and may periodically affect the set of analytes and analytical methods.

5.2 DATA QUALITY INDICATORS

This section discusses the following data quality indicators:

- Analytical measurement accuracy
- Analytical precision
- Representativeness

5.2.1 Analytical Measurement Accuracy

Accuracy can be estimated by calculating the percentage recovery of laboratory matrix spike samples using the following equation, described in *Preparation Aids for the Development of Category II Quality Assurance Project Plans* (EPA 1991):

$$\%R = \left(\frac{s - u}{C_{sa}} \right) 100$$

Where

%R = percentage recovery
s = measured concentration in spiked laboratory aliquot
u = measured concentration in un-spiked laboratory aliquot
C_{sa} = actual concentration of spike added

Accuracy can also be estimated by calculating percentage recovery for the use of standard reference materials or surrogates using the following equation, as outlined in *Preparation Aids for the Development of Category II Quality Assurance Project Plans* (EPA 1991):

$$\%R = \left(\frac{C_m}{C_{srm}} \right) 100$$

Where

C_m = measured concentration of standard reference material or surrogate
C_{srm} = actual concentration of standard reference material or surrogate

Table 3B-5 lists the parameters for which accuracy will be estimated.

5.2.2 Analytical Precision

Precision can be estimated by analyzing matrix spikes and matrix spike duplicates. The relative percentage difference between the analytical results for the matrix spike samples and the matrix spike duplicate samples will be calculated as outlined in *Preparation Aids for the Development of Category II Quality Assurance Project Plans* (EPA 1991):

$$RPD = \frac{|S_{ms} - S_{msd}|}{\left(\frac{S_{ms} + S_{msd}}{2} \right)} \times 100$$

Where

RPD = relative percentage difference
S_{ms} = matrix spike sample

S_{msd} = matrix spike duplicate sample

Precision can also be estimated by analyzing duplicate samples. The relative percentage difference between the analyte levels measured in these samples will be calculated using the following equation, provided in *Preparation Aids for the Development of Category II Quality Assurance Project Plans* (EPA 1991):

$$RPD = \frac{(C_1 - C_2)}{\left(\frac{C_1 + C_2}{2}\right)} \times 100$$

Where

RPD = relative percentage difference
C_1 = larger of the two observed values
C_2 = smaller of the two observed values

Table 3B-5 identifies those parameters for which precision will be estimated.

5.2.3 Representativeness

Representativeness is a qualitative QA objective that determines the degree to which a sample or group of samples is indicative of the subject being studied. It takes into account the size and volume of the sample, as well as the times and locations of sampling. The number of samples collected for the characterization of waste feed and secondary waste streams will be evaluated during the development of standard operating procedures to ensure that sampling is representative of the total waste being sampled.

Liquid samples taken within the WTP will be obtained from agitated vessels or piping systems to ensure that the sample taken represents the vessel contents.

5.3 DETECTION LIMITS AND ESTIMATED QUANTITATION LIMITS

Method detection limits (MDLs) and the estimated quantitation limits (EQLs) supporting waste characterization analysis will be established in accordance with Attachment IV of the Regulatory DQO (Wiemers and others, 1998). For other analyses supporting environmental decision-making, the laboratory will establish the MDLs and EQLs in conformance with SW-846 (EPA 1997) or other guidance.

The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99 % confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix type containing the analyte.

EQLs are defined as the lowest concentration that can reliably be achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The EQL is generally 5 to 10 times the MDL. For many analytes, the EQL analyte concentration is selected

as the lowest non-zero standard in the calibration curve. Sample EQLs are highly matrix-dependent.

The MDLs and EQLs will be determined as defined by Chapter 1 of SW-846 (EPA 1997). The MDLs will include sample preparation methods, and will be determined by spiking uncontaminated water and solid (typically sand) with known concentrations.

The EQL is affected by:

- Sample matrix
- Sample volume or mass used
- Final concentrate volume or final digestate volume from sample preparation
- Amount introduced into the instrument for quantitation
- Use of dry or wet weight for reporting solids

Each EPA method in SW-846 (EPA 1997) lists target EQLs in water, soil, or both matrices. Water EQLs are lower than those in soil or waste. For various waste types, the methods list EQL multipliers relative to water or soil. The SW-846 methods stress that the EQL will differ by matrix and should be evaluated by matrix.

Certain samples may be reduced in sample size or diluted for waste minimization and to comply with the as low as reasonably achievable (ALARA) philosophy. The SW-846 (EPA 1997a) "method hotline" indicates that sample size is not a method modification unless detection limits are not sufficient for making decisions.

Section 6.3 and Table 3B-5 present the project-specific analytical performance requirements.

5.4 REPORTING REQUIREMENTS

Data generated from laboratory analyses will be reported to BNI in an organized format that contains the supporting information required in the data report package for the appropriate level of data verification or validation. Refer to Section 8.0 for a discussion of the data report package and to Section 9.0 for a discussion of data verification and validation.

The reported data will identify the concentration units (such as milligrams per liter) and appropriate laboratory qualifiers. Data reported as non-detected will be referenced against a stated MDL or instrument detection limit value. Values between the MDL and the EQL will be qualified and documented. If selected reporting limits are used instead of EQLs or detection limits, the reporting limits will be consistent with the specific data reporting requirements presented throughout the WAP.

6.0 DATA ACQUISITION AND MEASUREMENT

This following section addresses the QA requirements for data acquisition and measurement.

6.1 SAMPLING PROCEDURES AND MANAGEMENT

Subsections 6.1.1 through 6.1.4 provide direction on the types of sampling procedures to be implemented and the types of equipment that may be used to support the sampling, as well as guidance on how to manage and document field activities.

6.1.1 Sampling Procedures and Design

The sampling procedures to be implemented for analyzing waste feed from the DST system unit to support characterization of the waste feed, and the characterization of secondary waste streams are described in the following sections. Proposed sampling methods are shown in Table 3B-2. For samples taken at the WTP, standard operating procedures for sample collection will be developed after the system design is complete and before waste is received for processing.

6.1.2 Selected Sampling Equipment

Equipment selected to support waste sampling activities will meet the requirements of the specific SW-846 method (EPA 1997) or other applicable guidance. If modifications of the procedure are needed, they will be requested in accordance with WAC 173-303-110.

When feasible, disposable equipment will be used to collect samples to obviate the need to decontaminate equipment after use. The process for decontamination of sampling equipment, when necessary, is presented in Section 6.1.3.3.

6.1.3 Sample Handling and Shipping

Personnel involved in sampling will be required to have read and understood the operating procedures for sampling before implementing sampling activities. The sample preservation, containers, and holding times for each of the types of analyses to be performed are specified in Table 3B-3.

Storage conditions will be evaluated to ensure that the samples remain representative. Samples will normally be transported to the analytical laboratory pneumatically, but samples may be hand carried.

A unique identification number generated by the laboratory information management system (LIMS) will be marked on sample containers before introducing the waste. This number will be recorded on the chain-of-custody form. The sample labeling and chain-of-custody documentation will be checked to ensure the traceability of each of the samples.

6.1.3.1 Chain-of-Custody

The ability to demonstrate that samples were obtained from the locations specified in the applicable WAP and that they reached the laboratory without alteration are key considerations for data resulting from laboratory analysis. Evidence of collection, shipment, reception at the laboratory, and laboratory custody until disposal will be documented using a chain-of-custody form. The chain-of-custody form will, as a minimum, supply the following information:

- Sample identification number
- Sampling date and time
- Sampling location
- Name of the sampler for manual sampling
- Shipping date
- Analyses to be performed
- Preservation method

A sample will be considered to be in custody when it is under any of the following conditions:

- In a person's possession
- In view, after having been in a person's physical possession
- Locked so that it cannot be tampered with, after having been in a person's physical custody
- Sealed with tamper-proof seal
- In a secured area, restricted to authorized personnel only

Chain-of-custody forms will be included in the final data report package. Electronic chain-of-custody forms and electronic signatures may be used.

The chain-of-custody practices and procedures for the WTP will address the following general requirements for custody records:

- Sample management planning and procedures will identify responsibilities, including interfaces between organizations for documenting possession of a sample from collection and identification through handling, preservation, shipment, transfer, analysis, storage, and final use.
- Sample traceability will ensure that it can be tracked from its collection through final use.
- Sample identification will be documented and checked before the sample is released for use.
- If individual samples have specific custody requirements, as required by documents such as the WAP, test plans, study plans or job packages, these requirements will be implemented.
- For samples with limited use or storage life, methods will be established that preclude using an out-of-date sample.

Implementing documents will identify those representative samples that need to be archived.

6.1.3.2 Sample Preservation, Containers and Holding Time

Table 3B-3 lists the sample container, preservation method, and holding time requirements for different types of analyses.

6.1.3.3 Maintaining and Decontaminating Field Equipment

Field equipment used to support waste monitoring and sampling activities will be maintained in accordance with manufacturer guidelines, and will be decontaminated prior to use. Disposable sampling equipment will be used whenever possible due to the high concentrations of radionuclides in the waste materials to be sampled.

Equipment decontamination will be performed according to approved procedures and consistent with guidance provided in the following references or by the manufacturer:

- *Test Methods for Evaluating Solid Waste - Physical/Chemical Methods*, SW-846 (EPA 1997)
- *A Compendium of Superfund Field Operations Methods* (EPA 1987)

6.1.4 Sampling Quality Assurance and Quality Control Procedures

The WTP Technical Manager (or designee) will be responsible for developing sampling procedures in accordance with the requirements of this QAPjP. QA audits and surveillances will be conducted by the WTP QA Manager (or designee) to verify that sampling activities are meeting the requirements of this QAPjP. Management assessments will also be performed by the WTP Analytical Laboratory Manager (or designee) to ensure that the waste sampling program is adequate and effective.

Revisions to established sampling procedures will be reviewed to determine their possible impacts on data quality and approved by authorized personnel prior to issuance and implementation. Field records and documentation, including field measurements, will be handled and preserved in a manner consistent with Section 4.3 of this QAPjP.

Quality assurance surveillances and audits, management assessments, corrective actions, and root cause analyses will be implemented as described in Section 7.1 of this document.

Sampling quality control (QC) procedures may involve the collection of blanks and duplicate samples. The purpose and frequency of collection for each of these samples are presented in Table 3B-4, together with sampling QC objectives.

6.2 INSTRUMENT AND EQUIPMENT CALIBRATION, TESTING, INSPECTION AND MAINTENANCE

The following sections address instrument calibration, testing, inspection, and maintenance requirements.

6.2.1 Instrument Calibration Frequency

The WTP Analytical Laboratory Manager (or designee) will ensure that instruments are calibrated in accordance with approved procedures. Instrument calibration will comply with applicable requirements of the QA Manual. Instrument calibration records will be managed in accordance with Section 4.3.

6.2.2 Instrument and Equipment Testing, Inspection and Preventive Maintenance Requirements

The WTP Analytical Laboratory Manager (or designee) will ensure that laboratory instruments are routinely tested and inspected to confirm that they are in proper working order. Preventive maintenance schedules recommended by the equipment manufacturer will be implemented and documented.

6.3 SAMPLE PREPARATION METHODS, ANALYTICAL METHODS, AND ANALYTICAL PERFORMANCE REQUIREMENTS

The sample preparation methods, analytical methods and performance requirements (such as EQL, precision, and accuracy) for analyses are summarized in Table 3B-5, and are consistent with the requirements specified in SW-846 (EPA 1997). Any applicable analytical method provided in WAC 173-303-110 may be used for analysis. If an analytical method used for regulatory purposes other than the methods provided in WAC 173-303-110 are proposed, approval of the method will be requested from Ecology according to WAC 173-303-910(2). The proposed analytical method will not be used for regulatory purposes until Ecology authorizes the method. If modifications to a procedure are needed, they will be requested in accordance with WAC 173-303-110(4). The SW-846 (EPA 1997a) "method hotline" indicates that sample size is not a method modification unless detection limits are not sufficient for making decisions.

6.4 LABORATORY INFORMATION MANAGEMENT

The plant information network will be a database management system. It will be part of the integrated control network and will include the laboratory information management system (LIMS). Final sample and QC data will be stored in the LIMS database. At a minimum, this database will hold the sample number, sample collection date, analysis date, analytical methods employed, analytical results, and validation qualifiers. In the event of a LIMS system failure, this information will be recorded in paper form and entered into LIMS once the system is operating. For a more complete description of these software systems, refer to Section 6 of the WAP.

6.5 LABORATORY QUALITY CONTROL

Laboratory QC procedures will involve the analysis of duplicates, method blanks, and matrix spike samples. The purpose and frequency for each of these samples is presented in Table 3B-6.

7.0 PERFORMANCE ASSESSMENTS, CORRECTIVE ACTIONS, AND EVALUATIONS

The following subsections address assessment and oversight requirements.

7.1 ROUTINE LABORATORY ASSESSMENT AND CORRECTIVE ACTIONS

The WTP Technical Manager (or designee) will conduct periodic assessments to verify that laboratory procedures meet the requirements of this QAPjP. QA surveillances and audits will be conducted by the WTP QA Manager (or designee) to ensure that laboratory activities comply with applicable QA requirements. Management assessments will also be performed by the WTP

Analytical Laboratory Manager (or designee) to ensure that the laboratory program is adequate and effective.

Management assessments, QA surveillances and audits, corrective action, and root cause analyses will be conducted according to approved procedures.

7.2 DATA REDUCTION AND VALIDATION

Data reduction and validation procedures will be developed for data generated for environmental compliance according to the requirements of the current version of SW-846 (EPA 1997) or other applicable guidance, prior to the operation of the analytical laboratory. Validation and verification of analytical data is discussed in Section 9.0.

7.3 REPORTS TO MANAGEMENT

Conditions identified as having an adverse effect on quality, the significance of such conditions, and corrective actions will be documented, reported to the appropriate level of management, and resolved according to approved procedures.

The assessment reports may include the following items, as appropriate:

- Deviations from the requirements specified in this QAPjP.
- Limitations or constraints on the applicability of the resulting analytical data.
- Results of QA surveillances and audits of the waste analysis program.
- Management assessments of data quality in terms of MDLs, precision, accuracy, and representativeness. The quantitative performance indicators for precision and accuracy are given in Table 3B-5.

8.0 DATA REPORT PACKAGES

The data reports received from the laboratory will serve as documentation of an analytical project. The primary data reporting will be by electronic systems. The following are examples of the information contained in data reports documenting environmental support activities:

- Sample identifications
- Holding times, including:
  - Sampling date
  - Date the laboratory received the sample
  - Extraction or preparation date
  - Analysis date
  - Re-extraction or re-analysis dates
- Analytical parameters
- QA, including:

  - Descriptions of procedures and methods used to generate the results
  - Deviations from procedures
  - Analytical anomalies for raw data results, spikes, surrogates, and method blanks
  - Analytical qualifiers
  - Calibration and instrument tuning
  - Corrective actions implemented
- Raw analytical data, as appropriate
- Chain-of-custody, as appropriate

9.0 VERIFICATION AND VALIDATION OF ANALYTICAL DATA

The data verification and validation processes will ensure that the data resulting from the selected analytical method are consistent with the requirements specified in this QAPjP. Persons performing data verification or validation will be trained according to Section 4.2.

9.1 DATA VERIFICATION

The primary data reporting will be by electronic data systems. Data verification will be performed on laboratory data packages that support environmental compliance to ensure that their content is complete and in order. A page by page review of the data package will be performed to ensure that:

- The data package contains the required technical information.
- Deficiencies are identified and documented.
- Identified deficiencies are corrected by the laboratory and the appropriate revisions are made.
- Deficient pages are replaced with the laboratory corrections.
- Data package revisions are tracked.
- A copy of the completed verification report is placed in the data file.

9.2 DATA VALIDATION

Data validation ensures that the data resulting from analytical measurements meet the quality requirements specified in this QAPjP. Data validation will be performed on data packages that support environmental compliance.

A validation plan will be developed and implemented prior to the operation of the laboratory, according to guidance found in SW-846, Chapter 4 (EPA 1997), or other appropriate guidance.

10.0 DATA QUALITY ASSESSMENT

Data obtained will be evaluated to determine whether they are of the appropriate type, quality, and quantity to support their intended use. Such data quality assessment will be performed, in

accordance with *Guidance for Data Quality Assessment* (EPA 1996), on data packages used to ensure environmental compliance.

11.0 REFERENCES

11.1 PROJECT DOCUMENTS

24590-WTP-PL-ENV-01-002, *River Protection Project – Waste Treatment Plant Dangerous Waste Training Plan.*

24590-WTP-QAM-QA-01-001, *Quality Assurance Manual.*

24590-WTP-RPT-ENV-01-003, *River Protection Project – Waste Treatment Plant Waste Analysis Plan.*

11.2 CODES AND STANDARDS

ASTM. 2001. *Standard Test Methods for Compatibility of Screening Analysis of Waste,* Method D5058-90. American Society for Testing and Materials, West Conshohocken, Pennsylvania.

EPA. 1987. *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001b. US Environmental Protection Agency, Washington, D.C.

EPA. 1991. *Preparation Aids for the Development of Category II Quality Assurance Project Plans*, EPA/600/8-91/004. US Environmental Protection Agency, Washington, D.C.

EPA. 1994. *Guidance for the Data Quality Objectives Process*, EPA QA/G-4, September 1994. US Environmental Protection Agency, Washington, D.C.

EPA. 1996. *Guidance for Data Quality Assessment*, EPA QA/G-9. US Environmental Protection Agency, Washington, D.C.

EPA. 1997. *Test Methods for Evaluating Solid Waste, Physical Chemical Methods*, SW-846, Third Edition as amended. US Environmental Protection Agency, Washington, D.C.

EPA. 1998. *EPA Guidance for Quality Assurance Project Plans*, EPA QA/G-5, February 1998. US Environmental Protection Agency, Washington, D.C.

WAC 173-303. *Dangerous Waste Regulations*, Washington Administrative Code.

11.3 OTHER DOCUMENTS

Patello GK, Almeida TL, Campbell JA, Farmer OT, Hoppe EW, Soderquist CZ, Swoboda RG, Urie MW and Wagner JJ. 2001. *Regulatory DQO Test Plan for Determining Method Detection Limits, Estimated Quantitation Limits, and Quality Assurance Criteria for Specified Analytes.* PNNL 13429, Pacific Northwest National Laboratory, Richland, Washington.

Wiemers KD, Lerchen ME, Miller M and Meier M. 1998. *Regulatory Data Quality Objectives Supporting Tank Waste Remediation System Privatization Project.* PNNL-12040, Pacific Northwest National Laboratory, Richland, Washington.

Table 3B-1 Data Quality Objective 7-Step Process [a]

	Key Activities
Step 1: State the problem	• Identify the constituents of concern • Develop a conceptual site model • Formulate a concise problem statement
Step 2: Identify the decisions	• Identify the principle study questions that the study will attempt to resolve • Identify the alternative actions that may result once each of the principal study questions has been resolved • Integrate the principal study questions and alternative actions to form decision statements
Step 3: Identify required inputs	• Identify the information needed to resolve each decision statement • Define the source and level of quality for the information needed • Determine whether data of adequate quality already exist
Step 4: Define study boundaries	• Define the population of interest and the geographic area or volume to which each decision statement applies • Divide the population into statistically-based strata with relatively homogeneous characteristics • Define the temporal boundaries of the problem • Define the time frame to which each decision applies • Determine when to collect the data
Step 5: Develop a decision rule	• Define the statistical parameters (such as mean, upper confidence limit) • Determine the final action • Develop "if… then…" statements that incorporate the parameter of interest, scale of decision-making, action level, and actions that would result from the decision
Step 6: Specify tolerable limits on decision errors	• Define the expected concentration range for the analyte of interest • Identify the decision error • Define the null hypothesis • Select a statistical vs. non-statistical sampling design • For statistical designs, define the boundaries of the gray region and set tolerable limits for decision error

Step 7: Optimize the design	Non-statistical design • Summarize applicable screening method alternatives • Summarize applicable sampling method alternatives • Develop an integrated screening or sampling design Statistical design • Identify statistical sampling design alternatives (such as simple random, stratified random) and select the preferred option • Select the statistical hypothesis test for testing the null hypothesis • Evaluate various design options by varying the decision error criteria and width of the gray region • Select the preferred sampling design

[a] *Guidance for the Data Quality Objectives Process* (EPA 1994)

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Table 3B-2 Proposed Sampling Methods

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Waste Category	Waste Type	Type of Sample
DST system unit waste feed	Verification sample	Representative split sample from the Department of Energy
Solid	**Mixed Waste Streams**	
	Vitrified waste not meeting LDR standards	Grab
	Entrained solids	Grab
	Spent ion exchange resin	Grab
	Off-gas treatment system equipment and components	Grab or smear
	Spent carbon and catalyst from off-gas treatment	Grab
	Out-of-service equipment	Grab or smear
	Dangerous or Mixed Waste Streams	
	Laboratory waste	Grab
	Maintenance waste	Grab
	Used personal protective equipment	Grab
Liquid	**Mixed Waste Streams**	
	Waste feed evaporator condensate[a]	Grab
	LAW melter feed evaporator condensate[a]	Grab
	LAW and HLW off-gas condensate[a]	Grab
	LAW and HLW melter off-gas scrubber blowdown[a]	Grab
	Cesium and technetium process condensate[a]	Grab
	Cesium and technetium ion exchange rinse water[a]	Grab
	Plant wastewater containing DST waste[a]	Grab

Waste Category	Waste Type	Type of Sample
	Dangerous or Mixed Waste Streams	
	Maintenance waste	Grab
	Off-specification chemicals	Grab

[a]These aqueous waste streams are collected in the effluent mixing tank prior to sampling.

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Table 3B-3 Sample Preservatives, Containers, and Holding Times

2

Analysis	Container	Minimum Sample Size[a]	Preservative	Holding Time
Liquid Samples				
Total organic carbon	Plastic	1 mL	H_2SO_4 to pH<2 Cool to 4 ^oC	28 days
PCB[b] compounds	Plastic	10 mL	Cool to 4 ^oC	7 days (extraction) 40 days (analysis)
pH	Plastic	5 mL	None	Analyze as soon as possible
Compatibility	Plastic	10 mL	None	None
Solid Samples				
Total organic carbon	Plastic	0.1 g	Cool to 4 ^oC	28 days
PCB[b] compounds	Plastic	0.5 g	Cool to 4 ^oC	14 day (extraction) 40 days (analysis)

Notes: [a] Minimum sample size may change based on ALARA ("as low as reasonably achievable") philosophy

[b] PCB = Polychlorinated biphenyls

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Table 3B-4 Field Sampling Quality Control

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Sample Type	Frequency	Purpose
Water blank	The frequency will be determined and documented in operating procedures before sampling operations are begun.	This will be a water sample that receives the same analysis steps as the sample for the specified procedure. The blank will confirm that the water is not contaminated.
Equipment blank		A sample of analyte-free water used to rinse the sampling equipment. It is used to document of adequate decontamination of sampling equipment[a]. Analysis will be for tests performed for the specified procedure.
Duplicate		This QC sample is a second aliquot of the collected sample and is used to determine method precision.

[a] Decontamination will be performed if disposable equipment cannot be used.

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Table 3B-5 Analytical Method Requirements

2

CAS[a] Number	Constituent of Concern	Target EQL[b]	SW-846 Method (EPA 1997)		Precision	Accuracy
			Solid	Liquid		
None	Total organic carbon (TOC)	10 mg/L	9060	9060	80-120 %	80-120 %
1336-36-3	Polychlorinated biphenyls (PCBs)	3.3 mg/L	3550B/8082	3510C/8082	80-120 %	80-120 %
None	pH	2 to 12.5 pH units	9040B/ EPA 150.1	9040B/ EPA 150.1	± 0.1 pH unit [c]	± 0.1 pH unit [d]
None	Compatibility	± 1 °C	NA [e]	ASTM [f] D 5058-90	NA [e]	90-110 %

Notes: [a] Chemical Abstracts Service

[b] estimated quantitation limit

[c] results of replicate measurements

[d] comparison to calibration solution

[e] not applicable

[f] American Society for Testing and Materials (ASTM 2001)

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Table 3B-6 Laboratory Quality Control

2

Sample Type	Frequency	Purpose
Duplicate	The frequency will be determined and documented in operating procedures before analytical operations are begun.	This QC sample is a second aliquot of the collected sample and is used to determine method precision.
Method blank		An analyte-free matrix to which reagents are added in the same volumes or proportions as those used in sample processing. It is used to document contamination resulting from the analytical process. This method blank will be carried through the complete sample preparation and analytical procedure.
Matrix spike or matrix spike duplicate		This QC sample is spiked with known quantities of analytes. The QC spike ensures that the analysis is testing for the specified analyte.

Figure 3B-1 Simplified Flow Diagram and Sample Locations

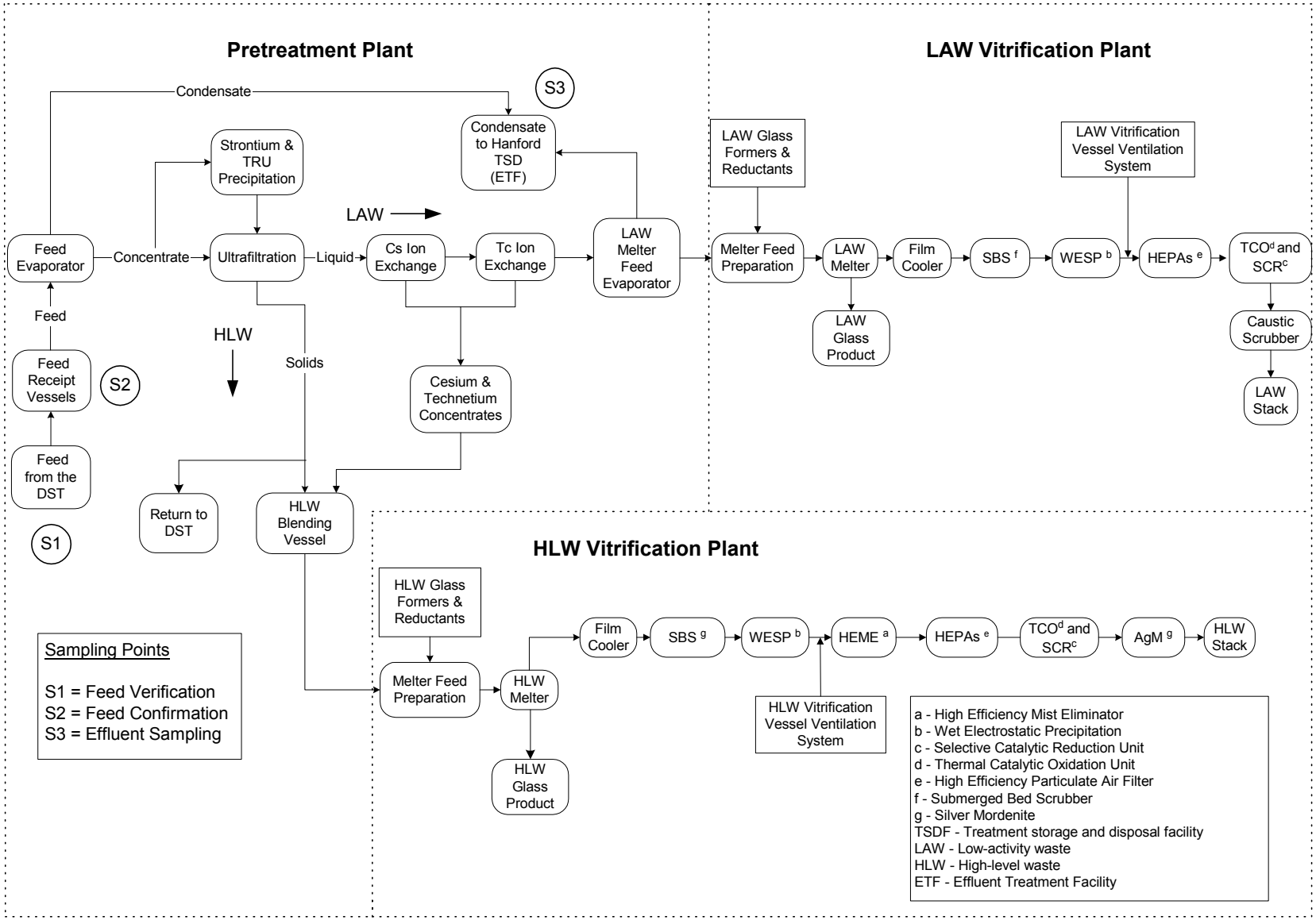

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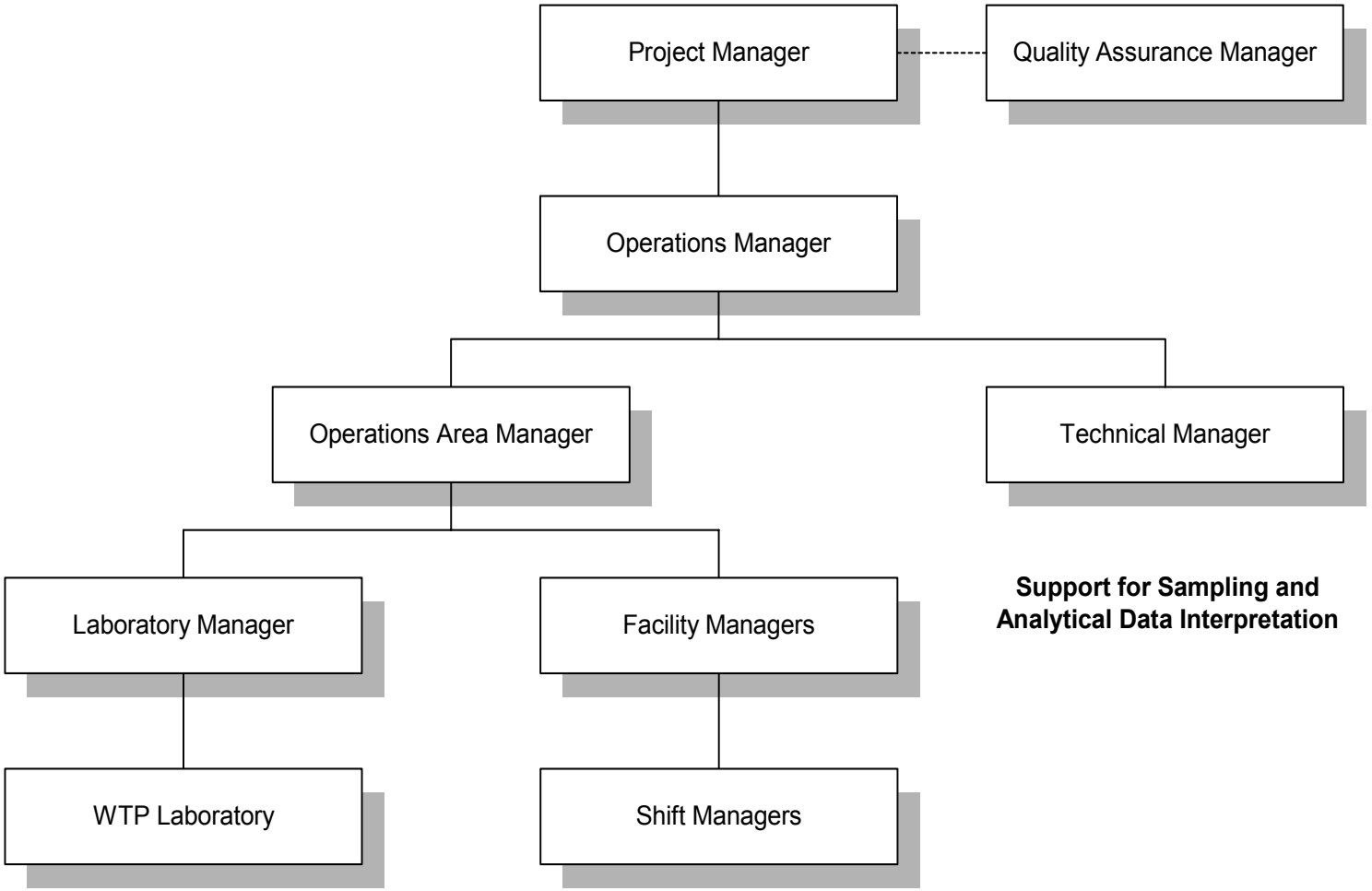
Figure 3B-2 WTP Sampling and Analysis Program Organization



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